

43. *Hyphantornis cucullatus*.

Oriolus cucullatus P. L. S. Müller, Syst. Nat. Suppl. 1776, p. 87: Senegal.

a, b. ♂ ad. et ♀ imm. Ninong, Manenguba Mts. 28.v.09.

The immature female shows no trace of yellow eyebrow-stripes; the upperparts are unusually grey, the plumage of the back being worn and faded, but the new feathers which are moulting in on the neck are brownish-olive, dark brown along the shaft. Wing 80 mm.

The male is in full breeding-plumage; the wing measures 86 mm.

XXXIII.—*On the Plumages of the Male Crossbill (Loxia curvirostra)*. By CLAUDE B. TICEHURST, M.A., M.R.C.S., M.B.O.U.

As I have had occasion recently to study the plumages of the Crossbill, I thought that perhaps the results of my endeavours might be of use if put on record. As is well known, the males of *Loxia curvirostra* exhibit a great variation in plumage, and it has always been a puzzle to me to know what this variation might mean. On looking up various authors who have gone into the subject, one does not find any great unanimity of opinion, and this I fancy was largely due to their not having any reliable guide to the age of their specimens. For example, to cite a few authors: Macgillivray (British Birds, vol. i. p. 428) quotes Temminck as saying that the males after the first moult become "dull red, yellowish red, greenish yellow or dull yellow shaded with reddish." Commenting on this, he goes on to say that he was unable to directly trace the changes, but judging from analogy they are not of this miscellaneous character, but are regular, and remarks that he is confident that the greenish yellow is the first winter plumage, followed at the next moult by a red and then by a brighter red plumage. Such a succession

of changes as Macgillivray thought took place would in a Palearctic passerine bird be most remarkable, if not unique.

Wheelwright (A Spring and Summer in Lapland, 1864, pp. 302-304), who had excellent opportunities during his sojourn in Sweden and Lapland, paid a good deal of attention to this subject, and the summary of his ideas is as follows. The males in the first winter assume the yellow-orange plumage, and in no case had he ever shot a male which, retaining any of the striped juvenile feathers, showed any sign that it would become red before the next moult; during the next summer he thought this plumage reddened without a moult; at the next (*i. e.* 2nd) autumn moult the plumage became the normal red, though perhaps some became orange-red. Occasionally, but very rarely, very old birds assumed a yellow-green dress. He felt convinced that the young never become red in the first autumn: he significantly says, however, that red birds are far the commonest, which would be very remarkable if no birds became red in their first year. He goes on to say that he has found males breeding in the same woods (1) in the striped plumage of youth*, (2) in the orange-red dress, (3) in the deep red dress.

The late Prof. Collett (Mindre Medd. vedr. Nörjes Fuglef. 1881-92, pp. 76-78) has some interesting remarks on this subject. He says: "An autumn nesting is found every year but in no great quantities, some hatching as late as October. In males of the autumn broods the plumage is, after moulting from the nest-feathering, always yellow-green, never red, and in such males traces of the striped juvenile plumage may yet be seen in February. These males I have found amongst the red ones the whole summer, and early in July I have shot a young male in which new red feathers were appearing amongst the yellow ones.

"Young males in the first winter are partly dark red, partly more or less yellow-red (confirmed also in this by Tschusi zu Schmidhoffen, Monatsch. D. Ver. Sch. Vogelw. 1888, p. 368),

* Surely an error.—C. B. T.

though it appears that young males as a rule are yellow-red; yet in those individuals which still carry a trace of the striped feathers of youth over the winter, the colour is always yellowish. Those individuals, which do not seem to be sexually mature by the beginning of the breeding season, are seldom found in the breeding quarters, but probably keep apart in flocks; perhaps these individuals only reach sexual maturity later in the summer, and the abnormal summer and autumn breeding which now and then takes place perhaps belongs in part to these. The colour in breeding males is always red."

The late Prof. Newton in Yarrell ed. iv. p. 200, says that in the juvenile plumage the males may be distinguished, as noted by Blyth, by the striations being considerably more distinct and more vividly contrasted than in the females. By September the young males have lost much of the striped dress and begin to assume the red plumage of maturity: some do this at once, and this seems to be the normal mode, though they do not so early develop their most brilliant hues; others, possibly less vigorous in constitution, have the red feathers mixed with yellow or become dull orange, the effect of red and yellow combined; others put on a yellowish or yellowish-green dress, and these are probably birds in which development is for some cause still further retarded. Absolute proof that this yellowish-green dress is ultimately replaced by red is wanting, but, though the wearers of it *may not unfrequently be found breeding in it*, there is good reason to believe that this change takes place.

With these rather conflicting opinions before me I started to work out the subject *de novo*, with no preconceived ideas, and I may say that it is only in this way and by the examination of birds in moult that one can arrive at the truth in such questions of obscurity. In order to get some definite basis to work on, the first thing to do was to examine juvenile birds in moult. Of these I was able to get together a very fair series, and was able to pick out an invaluable

character by which the males after the first autumn moult was completed could be distinguished from males of at least one year older. It will be found that the three or four (in some individuals more) outer feathers of the greater coverts, the whole of which series in the juvenile plumage have paler tips forming a slight wing-band, are not moulted with the rest of the series and body-feathers. Here, then, one has an absolute guide, which holds good until these pale tips are worn off some time in the next summer, as to which birds are less than a year old and which are more, for the latter have no pale tips to any of the greater coverts. Hence in two ways, by this guide, and by the examination of juvenile specimens in moult, I was able to arrive at what dress was attained in the first autumn. The conclusion that I came to was that such birds cannot be differentiated by the general coloration of the plumage from those of greater age: that is, it is possible to find among both first year and older birds, bright red individuals, dull red ones, others red with a little yellow, red with a fair amount of yellow, orange-red birds, yellow, and green-yellow ones. Of the two brightest red birds in the series (of some 200) one was a bird of the year, the other older. Almost every variety between a red bird and a yellow one may be found; and I may here point out that a bird showing distinctly red and yellow in its plumage is not necessarily moulting from red to yellow or *vice versa*, but the feathers may be part of the one plumage, and it is even possible to find feathers which are partly yellow and partly red. In one extremely handsome variety the whole plumage is bright lemon-yellow interspersed with bright scarlet feathers; two specimens only, neither of them moulting, were of this variety, so it is probably rare: one was a bird of the year, the other older. The yellow or green-yellow birds are nearly invariably birds of the year, though this plumage does very rarely occur in birds of greater age.

Since there are so many variations in dress in male Crossbills of the first autumn, one would not expect to find any

remarkable differences at the second autumn. To solve this question with certainty is a difficult matter, since our only guide as to which birds are only a year old and which are two years or more, is frequently lost: that is to say, that by the time the one-year-old bird moults, the pale edges to the juvenile coverts are often worn off. However, I have been able to examine four birds at the second autumn moult, showing such traces of the juvenile wing-bar that there could be no doubt that they had certainly only just completed the first year. Of these, one is a yellow bird moulting into a red plumage but mixed with new yellow and red feathers in the rump; two are orange-yellow birds with here and there a red tinge, both are moulting into a rich rose-red plumage; the fourth is a dull red bird worn to coppery red and is moulting on the flanks, chin, and cheeks to lemon-yellow.

I have been able to examine about a dozen birds at the post-nuptial moult in which there was no trace of the juvenile coverts remaining; however, of course some of these may yet have been birds of the previous year in which the pale edges had been worn off. Of these, two rather resemble the last bird described: they are both red birds, one acquiring new lemon-yellow feathers almost everywhere, the other new yellow feathers on the neck and yellow-green feathers on the back. Three others are moulting more or less from red to red. As so many birds show when in full feather a mixture of red and yellow feathers in their plumage, it is impossible to say that those which are in moult, and show some yellow feathers coming through, will not also, when moult is complete, show some red feathers; and from an examination of a large series of fully adult birds, I find that it is very rare to meet with any which do not show some red in the plumage, the lemon-yellow or green-yellow birds being nearly always birds of the year. Birds moulting from yellow to yellow so far I have not met with, though Dr. Hartert implies (*Vögel pal. Fauna*, p. 118) that this occurs. That these yellow birds are not always at any rate birds of the year of *autumn* broods is, I think, certain, for I have seen two

such birds, obtained in June and July, in which only a trace of the juvenile feathers remained. Some of these yellow males are approached in colour by some of the brightest females, but the latter appear never to be so bright on the crown and mantle.

The striped juvenile plumage is moulted in the first autumn entirely except for the wings, tail, primary coverts, and the outermost three or four greater coverts; at each subsequent autumn every feather is moulted; I cannot find any evidence of any spring moult. The changes which take place as the breeding season advances is variable: some red birds become duller or coppery-red and some yellow birds become bronzy yellow, other red birds become a rather brighter red, others again seem to show little change. Some colour change, due to abrasion, in parts of the plumage, especially on the crown, is I think possible, as in some the red of the feathers is confined to the tips, and when these are worn off, the bronze-yellow of the bases of the feathers would become visible. The brightest red males in first plumage are tinged with red on the scapulars and wing-coverts and even on the bend of the wing (the so-called "*rubrifasciata*").

The period of moult in the Crossbill has long been a puzzle to me, as being such an early breeder one might suppose that, like a Rook, it would moult earlier than do most passerine birds, but this does not appear to be the case. Naturally, the period of moult is a rather variable one according to the earliness or lateness of the broods, but generally speaking it is much the same as in the other finches. Of the juvenile birds, I find the earliest to have finished its post-juvenile moult is one on June 23, but this and another on the 30th are the earliest which showed any moult at all. July and August appear to be the months in which this plumage is cast, but I find several in these months, and one even as late as September 28, in which no moult had begun. The latest bird in which moult was not complete was an odd one killed on Nov. 30. Of birds one or more years old, the earliest in moult was one on July 16, and the earliest completed

moult was shown in one on Sept. 23; the latest date by which no moult had begun was Aug. 20, though one on Sept. 19 had only just started, and the latest in uncompleted moult was on Oct. 26; so that one may say that September and a week or two on each side of it covers most of the adult moulting. October birds, whether young or old, are usually through the moult.

The meaning of this yellow plumage occurring in Crossbills has long been the subject of speculation; it was formerly put down to old age, but this theory has long been discarded. It is, however, a well known fact that red Crossbills as well as red males of *Carpodacus*, *Hematospiza*, and *Linota* invariably lose their red plumage after moulting in captivity, yellow replacing the red. This has been attributed to lack of proper food, air and exercise, or a combination of all three. Curious and interesting as this coincidence is, it is very difficult to see where it helps us in elucidation of this problem of dichromatism in wild birds. Another theory put forward to explain these yellow birds was that they were diseased or weakly individuals. This theory has been rather widely accepted, but will not, I think, bear investigation for a moment. To begin with, these yellow birds are far too numerous for them *all* to be diseased, weakly, or lacking in vigour; moreover, many of them are in very good condition. If, too, this change in colour is brought about by such conditions, why is it to be seen often in Crossbills and very rarely in other species? Then, again, we have Newton's and Wheelwright's assurance that these yellow birds *breed* in that dress, which does not look as if they were less vigorous than the red birds.

That the yellow feathers are not due to lack of pigment I have satisfied myself; microscopically, the red and the yellow pigments are confined to and evenly distributed throughout the rami except at the extreme tips, and it seems to me that there is in each an equal amount of a different pigment. There undoubtedly is, however, an interesting relationship between red and yellow occurring in birds. In the case of *Loxia*, *Carpodacus*, and *Pinicola*, generally

speaking, the males are red and the females yellow; we also find the same thing in some Minivets, while in the Scarlet Tanager and Orchard Oriole the red of the male in summer is replaced by yellow in winter and in females at all times of the year. Then, again, we find a yellow-headed variety, as Mr. Seth Smith informs me, of the Red-headed Gouldian Finch (*Poëphila mirabilis*) occurring in nature, and I have seen red feathers occurring among the bright yellow feathers of the Green Woodpecker. Many other such instances of correlation between red and yellow could doubtless be given.

It has been suggested by von Tschusi that this yellow dress of the Crossbill is atavistic, a reversion to an ancestral plumage,—a theory which it is well-nigh impossible to prove, and which appears to me little better than admitting one's ignorance of the explanation of the phenomenon. Seeing how very much more common this yellow dress is in males of the first year than in older birds, it is tempting to suggest that this plumage is the normal one for first-year birds, and is being gradually skipped over for the commoner red plumage; in slight support of this it may be remarked that the yellow plumage in the Pine Grosbeak males is the usual plumage of the first year, though red birds do also occur. However feasible this sounds, it will not explain the assumption of the yellow plumage in part or in whole by birds of more than one year.

From the lesson of the behaviour of birds in captivity towards coloration, it does seem probable that food has an influence on coloration and that some particular food is necessary to produce the red colour. Is it possible that at the period of moult, in any given area inhabited by Crossbills, there is not enough of this food to go round, and that as a consequence some birds do not get enough red-producing food and therefore moult into a yellow-green dress? This is of course only a theory, and proof for or against it, is, I am afraid, very difficult to obtain.